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Report of Water Masses Receiving Wastes from Ocean Dumping at the 106-Mile Dumpsite 1 October 1987 through 30 September 1988 with Additional Summary for Calendar Year 1988

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Abstract

The 106-mile dumpsite, a deep ocean site located 106 miles southeast of New York, receives sewage treatment sludge from several municipalities in New York and New Jersey. The site is occupied predominantly by slope water, however, incursions of shelf water and warm core rings occur periodically. Satellite infrared data are used to determine which water masses are present at the time of each dump. Records of sewage sludge dumping at the site are obtained from the Environmental Protection Agency (EPA).

This report, the thirteenth in a series of annual summaries, correlates data regarding volumes and dates of dumps at the site with information on the water masses present at each dump. A summary of the amounts of wastes received by each of the three principal water masses for fiscal year 1988 (1 October 1987 to 30 September 1988) is presented. An additional summary, including data for calendar year 1988, is attached. Future reports will be based on the calendar year to coincide with the EPA's reporting period.

For fiscal year 1988, a total of 1,840 X 10^6 gallons of sewage sludge was dumped at the 106-mile site and 1,954 X 10^6 gallons in calendar year 1988. About two-thirds (by volume) of the sludge was dumped in slope water for both periods, with the remainder received by warm core rings and shelf water.

Introduction

The 106-mile dumpsite is a deep ocean dumpsite located between 38°40'N to 39°00'N and 72°00'W to 72°30'W. As a result of regulations imposed by the Environmental Protection Agency, the 106-mile site has been designated to receive all municipal sewage treatment sludge originally scheduled to be dumped at the 12-Mile site (located in the New York Bight area, see Fig. 1). EPA regulations provide for two areas within the original 106-mile dumpsite for disposal of sludge and industrial waste. The municipal sludge site is an area bounded by coordinates 38°45'N to 39°00'N and 72°00'W to 72°05'W (76.83 square nautical miles). Westward of that is the industrial waste site, a circular area six miles in diameter, with center coordinates 38°45'N and 72°20'W (28.3 square nautical miles) (see Fig. 1).

Oceanographic conditions in the area of the 106-Mile site are discussed by Ingham et al. (1977) in regard to shelf, slope, and Gulf Stream waters. The site is occupied predominantly by slope water, however, incursions of other water masses occur periodically. Shelf water incursions into the region occur predominantly in the spring when fresh water runoff and increased wind forcing causes offshore movement of the shelf/slope front (Hilland and Armstrong 1980). Northward meandering of the Gulf Stream causes Gulf Stream water to move into the dumpsite region, although this phenomenon is rare. More commonly, warm core Gulf Stream rings may traverse the region from northeast to southwest, bringing strong currents and Gulf Stream or Sargasso Sea water to the site. Figure 1 is a schematic drawing of the dumpsite in relation to the "average" locations of the water masses in the northwest Atlantic Ocean. Figure 2 is a chart of the actual conditions that existed at a particular time (25 April 1988), illustrating that conditions in this region are complex and dynamic in contrast to "average conditions" illustrated in Figure 1.

Ocean Dumping at the 106-Mile Site

No industrial waste was dumped at the 106-Mile site in 1988. DuPont has withdrawn its application for permit renewal, therefore, no more industrial waste dumping is expected in the near future. Municipal sludge

mping at the 106-Mile site began in March 86 and increased throughout 1987, with the -mile dumpsite phased out completely in ecember 1987. The New Jersey and New ork municipalities, previously authorized) dump at the 12-mile site, are routing all vaste to the 106-mile site.

This report concerns all ocean dumping hat took place at the 106-mile site from 1 October 1987 to 30 September 1988, the thirteenth in a series of annual summary reports. An addendum is included which documents dumping from 1 January to 31 December 1988. Future reports will be compiled for calendar years, to coincide with EPA reporting periods. The purpose of this report is to correlate the water masses present, i.e. shelf, warm core ring, and Gulf Stream waters, with the time and location of the disposals, to identify which masses received the dumped material.

Methods

Two methods were used to delineate locations of water masses with respect to dates of dumping at the 106-mile site. The first method was based on high resolution (1 km) digital data collected by the Advanced Very High Resolution Radiometer (AVHRR) sensor aboard the NOAA-series of polar-orbiting satellites. As described by Barton (1987), the data are received by telecommunication links at the University of Rhode Island's Oceanographic Remote Sensing Laboratory and are atmospherically and geographically corrected and enhanced to identify thermal features. Every image was inspected visually to determine water masses present at the dumpsite for each day of the year. On approximately 70 percent of the days, the digital imagery was clear enough to make a determination.

Whenever periods of cloudy weather obscured the satellite image of the sea surface, a second method was used to determine the water masses present at the dumpsite. This method, used in previous reports, (Bisagni 1985) was based on the weekly Modified Oceanographic Analysis Charts from the Marine Climatology Investigation (Fig. 2, for example). While these charts were at a much lower resolution than the digital imagery, they provided acceptable approximations of water mass locations during cloudy periods. The dumpsite location was drawn on a transparent overlay and placed on each chart so the water mass present at the site could be noted. This method provided observations for about 30 percent of the days in the study period. In both methods, a correlation was made between the date of a dump and the water mass that covered the area at the time of a dump.

Sludge dumping records were obtained from the Environmental Protection Agency, Region II, New York City. As in past years, Coast Guard logs of dumping activity were used through April 1988. In May 1988 the reporting method was changed to accommodate the new automatic navigation systems installed on many of the vessels. After that time, dumping data were collected from the monthly reports to EPA and Ocean Dumping Notification forms submitted by the dumpers.

There was some question as to the accuracy and completeness of the Ocean Dumping Notification forms as compared to the Coast Guard logs. To check the data received from the dumpers, volume summaries submitted by the generators were also obtained. The yearly totals reported by generators were compared with those calculated from the data from the dumpers. These totals agreed with each other to within 5 percent. Therefore, it is assumed, that any discrepancy between methods of gathering the dumping data is minor and does not affect significantly results reported here.

Results and Discussion

A total of 1,840 X 10^6 gallons (7.86 X 10^6 tons) of sewage sludge was dumped in the

site from 1 October 1987 to 30 September 1988. Approximately 66 percent of the sludge (by volume) was received by slope water, 16 percent by warm core ring/Gulf Stream water, and 18 percent by shelf water.

Amounts of sludge and receiving water masses are listed in Tables 1 and 2. Table 1 lists the dates of sludge disposals, the receiving water mass, and the approximate volumes of sludge material that each water mass received. Table 2 includes the total amounts and percentages by volume of sludge and by number of dumps that each water mass received. The values calculated for 1988 are close to the long term percentages of water masses present at the dumpsite as reported by Bisagni (1985).

Acknowledgements

I would like to thank Frank Csulak and Douglas Pabst of the Marine Wetlands and Protection Branch, U. S. EPA Region II, for their help in acquiring sludge dumping data and providing other pertinent information necessary for the preparation of this report.

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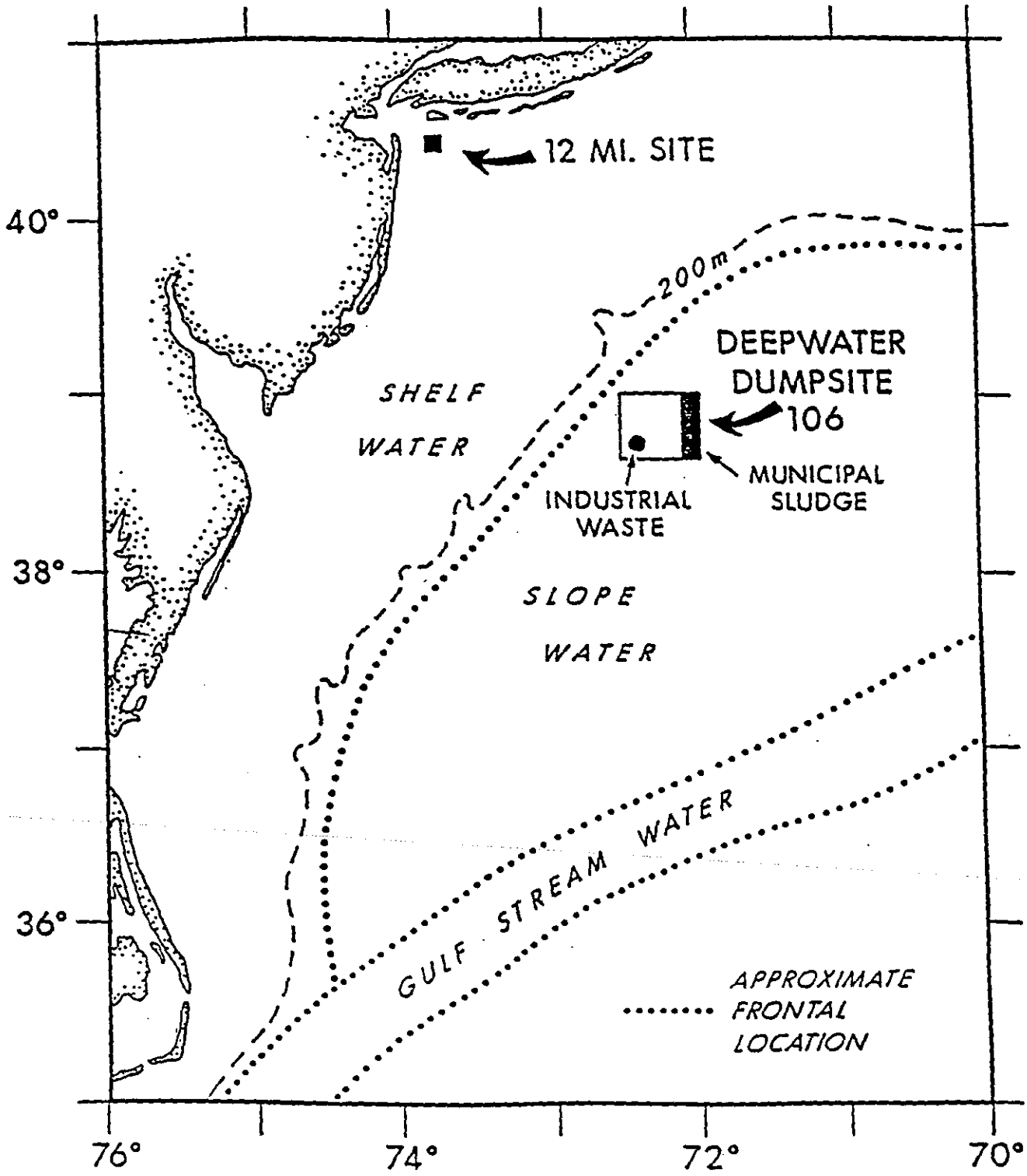

Figure 1. Chart showing the 12- and 106-mile dumpsites in relation to the average locations of water masses in the New York Bight region.

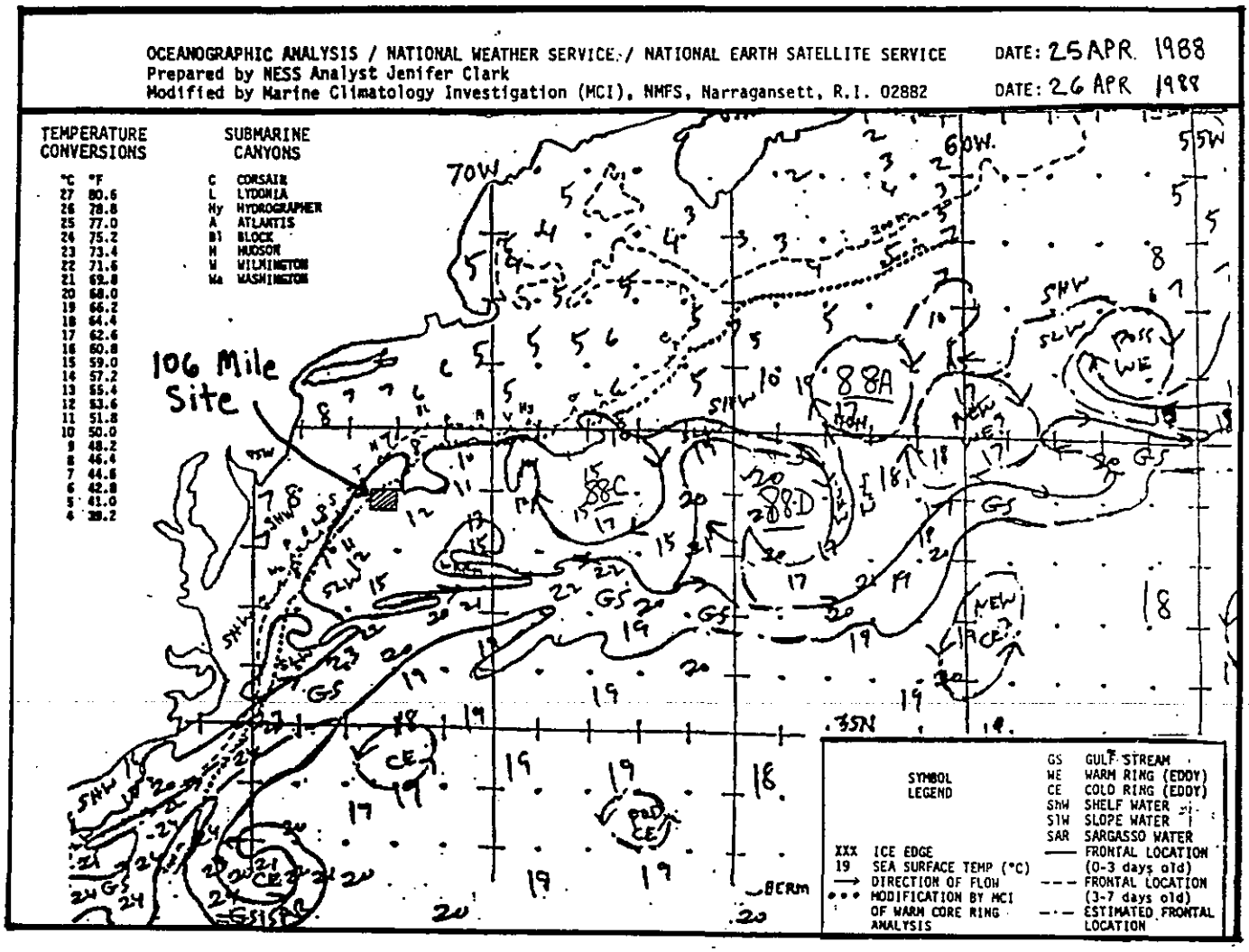

Figure 2. Modified Oceanographic Analysis chart showing sea surface conditions and location of 106-mile dumpsite. Prepared by National Weather Service on 25 April 1988 and modified by NOAA/NMFS Marine Climatology Investigation on 26 April 1988.

Table 1. Volume and range of dates of sewage sludge discharged into each water mass from 1 October 1987 to 30 September 1988

Range of Dates Month/Day/Year	Volume Discharged 10^6 gallons	(wet tons)	Receiving Water Mass
10/01/87 - 11/21/87	248.546	(1,062,162)	Slope water
12/04/87 - 12/22/87	80.613	(344,500)	"
12/26/87 - 01/30/88	168.297	(719,218)	"
02/08/88 - 02/21/88	70.951	(303,209)	"
03/17/88 - 03/28/88	53.983	(230,697)	"
04/05/88 - 05/12/88	166.238	(710,419)	"
05/15/88 - 05/16/88	3.510	(15,000)	"
05/18/88 - 05/26/88	47.762	(204,111)	"
05/28/88	7.050	(30,128)	"
06/03/88	6.356	(27,162)	"
06/09/88 - 06/20/88	79.909	(341,491)	"
06/22/88 - 07/14/88	130.980	(559,744)	"
08/31/88 - 09/30/88	160.510	(685,940)	"
Total	**1,224.705**	**(5,233,782)**	
11/22/87 - 12/03/87	51.426	(219,769)	Shelf water
12/23/87 - 12/25/87	10.575	(45,192)	"
01/31/88 - 02/07/88	45.444	(194,205)	"
02/22/88	4.095	(17,500)	"
02/24/88 - 02/29/88	37.866	(161,821)	"
03/01/88 - 03/16/88	84.135	(359,551)	"
03/29/88 - 04/04/88	29.091	(124,321)	"
05/13/88 - 05/14/88	3.627	(15,500)	"
05/17/88	4.812	(20,564)	"
05/27/88	7.018	(29,991)	"
05/29/88 - 06/02/88	21.571	(92,184)	"
06/04/88 - 06/08/88	26.089	(111,491)	"
06/21/88	2.878	(12,299)	"
	Total = 328.627	**(1,404,389)**	
07/15/88 - 08/30/88	286.685	(1,225,150)	Warm core rings
Total	**286.685**	**(1,225,150)**	

Table 2. Number and volume (gallons) of dumps made into each water mass from 1 October 1987 through 30 September 1988

Water mass type	Volume (gal)	(%)	No. of dumps	(%)
Slope water	$1{,}224.7 \times 10^6$	66.5	380	65.5
Shelf water	328.6×10^6	17.9	115	19.8
Warm core ring	286.7×10^6	15.6	85	14.7
Total	$1{,}840.0 \times 10^6$		580	

ADDENDUM

This addendum summarizes all ocean dumping that took place at the 106-Mile Dumpsite from 1 January 1988 to 31 December 1988. All future reports will cover the calendar year rather than fiscal year, the reporting period for prior years. This change is being incorporated to coincide with EPA reporting period. Data in this addendum were collected and compiled following the methods described in the attached, fiscal year report.

A total of 1,954 X 10^6 gallons (8.35 X 10^6 wet tons) of sewage sludge was dumped in the site in 1988. Approximately 60 percent of the sludge (by volume) was received by slope water, 24 percent by warm core rings and 16 percent by shelf water.

Disposal amounts and receiving water masses are listed in Tables A1 and A2. Table A1 lists the dates of sludge disposals, the receiving water mass and the approximate volumes of sludge material that each water mass received. Table A2 includes the totals and percentages by volume and by number of dumps that each water mass received.

Table A1. Volume and range of dates of sewage sludge discharged into each water mass from 1 January to 31 December 1988

Range of Dates Month/Day/Year	Volume Discharged 10^6 Gallons	(wet tons)	Receiving Water Mass
01/01/88-01/30/88	148.206	(633,359)	Slope water
02/08/88-02/21/88	70.951	(303,209)	"
03/17/88-03/28/88	53.983	(203,697)	"
04/05/88-05/12/88	166.238	(710,419)	"
05/15/88-05/16/88	3.510	(15,000)	"
05/18/88-05/26/88	47.762	(204,111)	"
05/28/88	7.050	(30,128)	"
06/03/88	6.356	(27,162)	"
06/09/88-06/20/88	79.909	(341,491)	"
06/22/88-07/14/88	130.980	(559,744)	"
08/31/88-10/29/88	347.457	(1,484,859)	"
10/31/88-11/20/88	108.474	(463,564)	"
Total	**1,170.876**	**(5,003,744)**	
01/31/88-02/07/88	45.444	(194,205)	Shelf water
02/22/88	4.095	(17,500)	"
02/24/88-02/29/88	37.866	(161,821)	"
03/01/88-03/16/88	84.135	(359,551)	"
03/29/88-04/04/88	29.091	(124,321)	"
05/13/88-05/14/88	3.627	(15,500)	"
05/17/88	4.812	(20,564)	"
05/27/88	7.018	(29,991)	"
05/29/88-06/02/88	21.571	(92,184)	"
06/04/88-06/08/88	26.089	(111,491)	"
6/21/88	2.878	(12,299)	"
10/30/88	5.154	(22,026)	"
11/21/88-11/22/88	11.112	(47,487)	"
12/25/88-12/30/88	29.142	(124,538)	"
Total	**312.034**	**(1,333,479)**	
07/15/88-08/30/88	286.685	(1,225,150)	Warm core rings
11/23/88-12/24/88	184.075	(786,645)	"
Total	**470.760**	**(2,011,795)**	

Table A2. Number and volume (galons) of dumps made into each water mass from 1 January 1988 to 31 December 1988

Water Mass Type	Volume (gal)	(%)	No. of Dumps	(%)
Slope water	$1{,}170.9 \times 10^6$	(59.9)	364	(59.1)
Shelf water	312.0×10^6	(16.0)	110	(17.9)
Warm core ring	470.8×10^6	(24.1)	142	(23.0)
Total	$1{,}953.7 \times 10^6$		616	